

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401- 7906**

CLEANUP AND ABATEMENT ORDER NO. R3-2007-0077

Issued to

**Olin Corporation
425 Tennant Avenue, Morgan Hill
Santa Clara County**

This Order is issued to Olin Corporation, hereafter referred to as Discharger, based on provisions of California Water Code section 13304, which authorizes the California Regional Water Quality Control Board, Central Coast Region, (hereafter Central Coast Water Board or Water Board) to issue a Cleanup and Abatement Order (Order), and on Water Code section 13267, which authorizes the Water Board to require preparation and submittal of technical and monitoring reports.

The Central Coast Water Board finds:

PROPERTY OWNERSHIP AND OPERATIONS

1. As described herein, and in the administrative record of the Central Coast Water Board, Olin Corporation (Discharger) caused or permitted the discharge of perchlorate to waters of the state from the former Olin manufacturing facility in Morgan Hill (Facility). The Discharger caused or permitted perchlorate-containing waste to be discharged into waters of the State causing and continuing to threaten to cause a condition of pollution or nuisance.
2. The Facility consists of a 13-acre parcel and is located at 425 Tennant Avenue, Morgan Hill, Santa Clara County, as shown on **Figure 1**. The Facility is approximately 30 miles southeast of San Jose and 0.5 miles west of Highway 101 in the City of Morgan Hill. The property (Assessor Parcel Number 817-029-028) is zoned light industrial and is surrounded primarily by commercial property. The Facility property is vacant, and all permanent building structures have been removed. Rural residential, agricultural, and urban land uses exist beyond and downgradient of the Facility. The geographic coordinates are 121° 38', 9" W, 37° 7', 0" N.
3. The Discharger has owned the property from at least 1956 to present. The Discharger manufactured signal flares at the Facility for approximately 32 years from 1956 to 1988. Standard Fusee Corporation leased the Facility and manufactured signal flares for approximately seven years, from 1988 to 1995. Potassium perchlorate was used by the Discharger and Standard Fusee Corporation to

manufacture flares from 1956 to 1995. The Discharger and Standard Fusee Corporation stored and used potassium perchlorate, strontium nitrate, chlorate, and other chemicals at the Facility as ingredients of highway safety flares. Perchlorate was first detected at the Facility in August 2000, during a due diligence investigation by a potential buyer. The Discharger informed the California Office of Emergency Services and the Santa Clara County Environmental Health Department on August 29, 2000, about the perchlorate release, as required by applicable state and local release reporting laws. The Discharger and the Central Coast Water Board staff made initial contact regarding the perchlorate discharges in February 2001. Perchlorate discharges are suspected to have originated from the Discharger's use of an unlined evaporation pond to dispose of wastes from the cleaning of the ignition material mixing bowls, onsite burning of cardboard flare coatings, and accidental spills. Discharges of perchlorate likely occurred when water (onsite uses and rain) came into contact with solid salts of perchlorate in the soil. The Central Coast Water Board never formally regulated waste disposal practices while the Facility operated.

4. The Discharger has been the sole property owner from at least 1956 to the present. During its occupancy of the Facility, the Discharger conducted activities that caused waste to be discharged or deposited waste where it was discharged into waters of the state and where it has created and threatens to create a condition of pollution or nuisance. At all times that the Discharger owned the Facility, the Discharger had knowledge of the activities that resulted in the discharge of perchlorate and the legal ability to control or prevent the discharge from the property
5. Discharger's investigation reports, listed in Finding 30 below, describe the presence of perchlorate used by the Discharger in onsite soil and underlying groundwater. Characterization efforts indicate the unexplained presence of perchlorate in groundwater up to four miles northeast (upgradient) from the Facility.
6. This Order requires implementation and completion of all necessary investigation and remedial actions (hydraulic control and clean up) associated with the perchlorate plumes emanating from the Facility. This Order requires additional assessment activities and includes an updated schedule to ensure timely and effective completion of the necessary investigation and remedial actions.
7. This Order applies to the entire Facility and to all areas beyond the property boundary, in all directions, that have been impacted by perchlorate that originated from the Facility. Perchlorate from the Facility is present in underlying soil and groundwater and groundwater outside the Facility property boundaries.

BACKGROUND

8. **Orders:** The Central Coast Water Board has provided regulatory oversight of soil and groundwater investigations and cleanup at the Facility since February 2001. The Facility has been regulated previously by Central Coast Water Board orders including cleanup and abatement orders, three waivers of waste discharge requirements, and onsite and offsite investigations pursuant to Water Code Section

13267 Orders (13267 Orders). These 13267 Orders require investigation of onsite and offsite impacts to soil and groundwater, and impose monitoring and reporting programs. Monitoring and Reporting Program (MRP) No. R3-2001-161 (revised) and MRP No. R3-2003-0168 were issued to the Discharger and Standard Fusee Corporation using Water Code Section 13267 authority. The current status of the various orders issued is described below.

- a. **Replacement Water** - On July 7, 2004, the Central Coast Water Board issued Cleanup and Abatement Order No. R3-2004-0101 (Order No. 0101) to require the Discharger and Standard Fusee to provide replacement water to affected well owners. Presently, the Discharger alone provides replacement water to well users whose wells have perchlorate concentrations greater than 6.0 micrograms per liter ($\mu\text{g/L}$), in accordance with Order No. 0101, as revised by the State Water Resources Control Board (State Board) Order WQ 2005-0007, adopted on May 19, 2005, and Central Coast Water Board staff's letter dated October 6, 2006. The October 2006 letter clarifies replacement water requirements and post bottled water termination monitoring. As of the adoption date of State Board Order No. 2005-0007, the Discharger has replaced the City of Morgan Hill's Tennant Avenue municipal water supply well by paying for the San Pedro Well.

Based on the Third Quarter 2007 Groundwater Monitoring Report, 37 domestic supply wells currently exceed the maximum contaminant (MCL) compared to 68 wells one year ago. Olin operates ion exchange (IX) systems on 15 domestic supply wells. Olin began IX system installation at wells exceeded $10 \mu\text{g/L}$, then at wells with concentrations between $8.0\text{-}9.9 \mu\text{g/L}$. Currently, all wells with perchlorate concentrations greater than $8.0 \mu\text{g/L}$ have IX systems on them (three of which are municipal supply wells in the San Martin community). There are two domestic wells with concentrations of perchlorate greater than $8.0 \mu\text{g/L}$ that do not have IX systems. Olin has not equipped these wells with IX systems because one of these wells is located on a vacant property and the other well is not being used as a potable source. Olin is required to continue providing an alternative water supply until compliance with State Board Order No. WQ 2005-0007 is achieved. **Figure 2** shows the locations of the wells equipped with ion exchange systems.

- b. **Onsite Groundwater Treatment** - On December 8, 2003, the Central Coast Water Board issued General Waiver of Waste Discharge Requirements Resolution No. R3-2002-0115 (General Waiver). The General Waiver authorized the Discharger to extract and treat onsite groundwater, and discharge it to the City of Morgan Hill's Butterfield Retention Basin. On November 2, 2005, the Central Coast Water Board conditionally amended the General Waiver. The General Waiver amendment authorizes the Discharger to extract and treat onsite groundwater, and discharge the treated water via onsite recharge (injection) wells, located on the north end of the Facility. The Discharger retains authorization to discharge treated groundwater to the City of Morgan Hill's Butterfield Retention Basin during emergencies. The Discharger began

uninterrupted operation of the onsite treatment system on February 23, 2004. Groundwater is extracted from the shallow and upper-intermediate aquifers extraction wells located on the southern boundary of the Facility at a rate ranging from 50 to 175 gallons per minute (gpm). Olin filters the extracted groundwater and then a perchlorate-specific ion-exchange process removes the perchlorate. The treated groundwater is re-injected at a rate of 50 to 250 gpm. As of March 3, 2006, treated groundwater is injected into the shallow (A-zone) aquifer using three injection wells located along the northern portion of the Facility.

The Discharger has removed perchlorate from offsite groundwater at fifteen wells that are currently fitted with ion exchange systems. For example, the West San Martin Water Works and San Martin County Water District community supply wells that serve water to numerous West San Martin households have been fitted with ion exchanges systems since April 2004. Additionally, even though Olin has not installed offsite extraction wells to date to hydraulically contain the plume core, the successful onsite soil remediation and the operation of the onsite hydraulic containment system has prevented additional perchlorate concentrations from discharging into offsite groundwater.

- c. **Onsite Soil Remediation** - On July 9, 2004, Central Coast Water Board issued Waiver of Waste Discharge Requirements Resolution No. R3-2004-0119 to regulate Discharger's onsite soil treatment activities.
- d. **Storm Water** - The Discharger managed storm water runoff pursuant to State Board Order No. 99-08 DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002 for Discharge of Storm Water Runoff Associated with Construction Activity. Notice of Termination was approved by the Central Coast Water Board on October 25, 2005.
- e. **Groundwater Characterization and Cleanup** - The Central Coast Water Board issued Cleanup and Abatement Order No. R3-2005-0014 (Cleanup Order No. 0014) on March 10, 2005. Cleanup Order No. 0014 requires Olin Corporation and Standard Fusee Corporation to conduct basin characterization and groundwater monitoring, propose an offsite groundwater cleanup level, and evaluate offsite short and long-term plume migration and cleanup alternatives. Cleanup Order No. 0014 established timeframes for offsite groundwater monitoring and cleanup, and required submission of technical reports to support those activities. Cleanup Order No. 0014, as amended by Central Coast Water Board Cleanup or Abatement Order No. R3-2006-0112 (issued on December 21, 2006) clarified Olin's and Standard Fusee's responsibility to fully characterize and cleanup groundwater pollution (in all directions) that originates from the Facility.
- f. **Northeast Area** - On September 25, 2006, the Central Coast Water Board rescinded a 13267 Order dated December 8, 2004 requiring investigation of northeast flow, issued to Olin Corporation and Standard Fusee Corporation for

425 Tennant Avenue, Morgan Hill. The 13267 Order had been subject to a conditional stay (Stay) beginning February 10, 2005. Olin filed a State Board petition of the 13267 Order, which was held in abeyance. On September 26, 2006, the Central Coast Water Board rescinded the 13267 Order without prejudice because the Discharger has satisfactorily complied with all of the conditions of the Stay, other than the perchlorate source and background study, which is being conducted by the Santa Clara Valley Water District (Water District).

The Discharger's December 6, 2006 Revised Cleanup Feasibility Study (Revised Cleanup FS Report) provided groundwater data that indicate other perchlorate source(s) may exist in groundwater north and northeast of the Facility. Nevertheless, the Central Coast Water Board attributes the perchlorate concentrations detected immediately north and northeast of the Facility to the Olin Facility.

9. This Order rescinds Cleanup Order No. R3-2005-0014 and Cleanup Order No. R3-2006-0112.
10. **Regional Geology and Hydrogeology:** The four- to five-mile wide Llagas Subbasin comprises the southern part of the NNW-trending Santa Clara Valley. The valley floor has an elevation of about 400 feet above mean sea level (MSL) near Morgan Hill, and slopes to an elevation of about 140 feet at the Pajaro River outlet in the southwest corner of the valley. This Subbasin is in part separated from the Hollister Valley to the SSE by the Lomerías Muertas and Flint Hills, and is separated from the northern Santa Clara Valley in the vicinity of the Coyote Narrows and the Coyote Creek drainage divide near Morgan Hill (*DWR 118, 1981*).
11. The southern Santa Clara Valley is naturally drained by Llagas Creek. This creek is initiated within the upper Llagas reentrant in the Santa Cruz Mountains along the west side of the valley. After entering the valley near Morgan Hill, Llagas Creek flows southward down the valley axis. Other major tributaries feeding into the Llagas, all derived from the west, are the Little Llagas and Uvas (Carnadero) Creeks. At the south end of the valley, Llagas Creek joins the Pajaro River, which flows westward to the Pacific Ocean at Monterey Bay. Thus, with respect to watershed hydrology, the Llagas is an open basin, with overland flow able to exit the valley via the Pajaro River. Unlike drainage from the Santa Cruz Mountains on the west, most of the Diablo Range adjoining the eastern side of the Llagas Subbasin is drained northward to San Francisco Bay via Coyote Creek. Overland flow in the Coyote Creek catchment is naturally focused into a major strike valley that is parallel to, and located about 1.5 miles west of the Diablo range front. This strike valley, presently containing the Anderson and Coyote reservoirs, is developed on the main trace of the Calaveras fault. Prior to damming, Coyote Creek exited the Diablo Range near the present Anderson dam located directly northeast of Morgan Hill, and flowed south toward the Pajaro River.

12. The Facility is located in the Llagas Subbasin of the Gilroy-Hollister Groundwater Basin in South Santa Clara County¹. The Llagas Subbasin is a northwest to southeast trending alluvial-filled structural depression that is, in part, the southern extension of the north bounding Coyote Valley Groundwater Subbasin. The Llagas Subbasin's northern boundary consists of a groundwater divide that is believed to coincide with the Coyote Creek alluvial fan topographic high as it emerges from the eastern foothills. The Llagas Subbasin is further bounded on the west by the Santa Cruz Mountains/Gavilán Range and on the east by the Diablo Range, and merges to the south with the Gilroy-Hollister Groundwater Subbasin. The Tertiary- to Mesozoic-age bedrock forming these mountain ranges is relatively impermeable and limits the extent of groundwater movement to the east and west and at depth. The regional and local aquifer systems are composed of alluvial deposits over valley basin bedrock and include Pliocene to Holocene age continental deposits of unconsolidated to semi-consolidated gravel, sand, silt, and clay.
13. **Stratigraphy:** Groundwater is found within the Subbasin in coarse-grain aquifer units deposited primarily by fluvial and possibly alluvial processes, including the shallow aquifer (surface to approximately 50 feet bgs), intermediate aquifer (approximately 70 to 180 feet bgs), and deep aquifer (approximately 200 feet bgs to sub-alluvium). The sub-alluvium unit that underlies the fluvial sediments contains more clay and is thus less permeable than the overlying aquifer units. The three main aquifer units are separated by aquitards deposited as either over bank or flood plain deposits and generally consist of silty material containing minor and discontinuous sand channels.
14. The Discharger has substantially improved the understanding of the Llagas Subbasin geology and hydrogeology through characterization from a detailed study² of additional geologic data from new monitoring wells and cone penetrometer test (CPT) borings installed during 2006 and 2007. The maximum depth that the Discharger have drilled boreholes is 567 feet below ground surface (bgs). A review of aquifer and aquitard sediment samples has resulted in the identification of six sedimentary facies:

Facies	Sedimentologic Features	Depositional Environment
A	Clast to matrix supported, red-brown angular pebble gravel	Morgan Hill piedmont
B	Clast support pebble gravel, locally cobbly, sandy muddy	Coyote-Llagas channels
C	Tan, medium to fine sand silt,	Proximal channel over

¹ The geologic and hydrogeologic features of the South Santa Clara Valley, which include the Llagas Subbasin, are described in *Evaluation of Ground Water Resources, South San Francisco Bay, Volume IV, South Santa Clara County Area, Department of Water Resources Bulletin 118-1, May 1981 (DWR 118, 1981)*.

² MACTEC, January 13, 2007 "Llagas Subbasin Characterization – 2006, Santa Clara County Olin/Standard Fusee, Morgan Hill California"

	irregularly laminated	bank
D	Orange to tan silt, irregularly laminated to extensively rooted	Dry expansive floodplain
E	Olive mud to clay, contains wood and mollusk shells	Pond or swamp on floodplain
F	Tan to medium to very fine sand, cross bedded	Eolian dunes on floodplain

The six sedimentary facies range from debris-flow like colluvium generated from the Santa Cruz Mountains (Facies A) to alluvial deposits (paleochannel structures to distal floodplain sediments) principally associated with southward flow of the ancestral Coyote Creek. Channel deposits (Facies B) represent the main aquifer units, while the floodplain (Facies D and E) represent the main aquitard units in the Subbasin. The mineralogy of the shallow aquifer (Facies B) indicates that a switch in the origin of the sediment (i.e., 'provenance') from the Diablo Ranges to the Santa Cruz Mountains occurred when the ancient south-flowing Coyote Creek changed direction to flow north to San Francisco Bay. The underlying A/B aquitard represents floodplain deposits flanking the then-active channel. The A/B aquitard is laterally extensive across much of the Llagas Subbasin. The intermediate and deep aquifers (Facies B; locally C and F) have a similar sediment composition and represent sediments deposited primarily by the ancestral Coyote Creek, including discontinuous fine-grain units representing floodplain deposits (Facies D and E).

15. **Underlying Site Stratigraphy:** Beneath the Facility, the aquifer system is composed of heterogeneous layers of clay, silt, sand, and gravel, deposited on a bedrock surface more than 440 feet bgs. The Discharger has characterized the Facility's subsurface into shallow, intermediate, and deep aquifer zones based on data collected during well installation activities. Shallow aquifer groundwater is predominately unconfined; however, local areas may be semi-confined by minor layers of silt and clay sediment within the aquifer, especially at greater depths within the shallow aquifer zone. Groundwater below the shallow zone aquifer is confined by fine-grained silts and clays that define the intermediate and deep aquifer zones aquitard units.
16. **Horizontal Groundwater Flow:** Groundwater in the shallow, intermediate, and deep aquifers south of the Facility generally flows to the south or southeast, consistent with regional flow patterns described in previous investigations (*DWR, 1981*) and topographic drainage into the Pajaro River. Olin measures groundwater elevations at multi-level monitoring wells, single-screen piezometers, and supply wells designed for domestic or agricultural use, all of which constitute 'monitoring wells'. Typical depth to first water in the Llagas Subbasin is variable and typically ranges from 15 to 30 feet below ground surface depending upon the season.
17. Regional groundwater flow is largely controlled by sedimentary facies, resulting in relatively complex lateral and vertical groundwater flow. Variables contributing to the complexities in groundwater flow include natural Subbasin topography, natural and artificial recharge, particularly in the upper aquifers (e.g., shallow and intermediate),

while induced gradients due to extensive pumping in the deep aquifer result in local perturbations in groundwater flow. In general, regional groundwater flow is toward the south in all three aquifers, except near large-capacity pumping wells where radial flow dominates flow in the lower intermediate and deep aquifers. A horizontal gradient of approximately 0.03 feet/foot is typically measured; however, the Discharger has measured local variations as high as 0.06 feet/foot. The horizontal gradient in these aquifers near the Facility is less than gradients measured farther to the south.

18. Aquifer tests in the Morgan Hill-San Martin area of the Llagas Subbasin indicate that the permeability of the upper and middle portions of the intermediate aquifer is considerably higher than that of the lower intermediate aquifer or that of the deep aquifer. The upper units in the Morgan Hill-San Martin area have an average hydraulic conductivity of over 100 feet per day (ft/day), whereas the lower units have an average hydraulic conductivity of less than 10 ft/day. The groundwater migration rates, for the shallow and intermediate aquifer groundwater are from 2 ft/day to 3 ft/day and groundwater migration rates in the deep aquifer flows at less than 0.5 foot/day. However, zones of higher hydraulic conductivity likely exist in the deep aquifer.
19. **Vertical Groundwater Flow:** The potential for vertical downward flow is greater beneath the City of Morgan Hill (i.e., within 1.5 miles of the Facility) than areas farther south. A downward gradient results from significant artificial recharge via the Water District percolation ponds in the northern portion of the Llagas Subbasin (northeast and east of the Facility) combined with significant pumping from the lower portion of the intermediate aquifer and the deep aquifers by City of Morgan Hill municipal wells. A slight vertical upward gradient in the southern portion of the Subbasin indicates regional discharge that occurs further south, probably at the Pajaro River.
20. **Groundwater Use:** Residents, agricultural operations, businesses and cities surrounding and downgradient of the Facility rely solely on groundwater for domestic, agricultural, and industrial supply purposes. The known perchlorate plume area extends for approximately ten miles downgradient. Historically, approximately 800 offsite wells have had perchlorate detections. During the third quarter of 2007, a total of 37 domestic supply wells had concentrations of perchlorate greater than 6.0 µg/L
21. **On and Offsite Investigations and Remedial Measures:** The Discharger caused or permitted perchlorate-containing wastes to be discharged to the soil at the Facility and to underlying groundwater. Due to the naturally permeable and transmissive nature of underlying and downgradient soils, perchlorate-containing wastes impacted onsite soil and onsite and offsite groundwater.
22. The spatial distribution of perchlorate in the Llagas Subbasin has been mapped using a combination of (1) multi-level monitoring wells and piezometers that have been installed south and northeast of the Facility, (2) over 800 domestic supply

wells, and (3) approximately 250 grab groundwater samples from 92 boreholes south and northeast of the Facility. One hundred and thirty-one depth-discrete screened intervals at 21 well locations southeast of the Facility are using continuous multi-channel tubing (CMT) and single-screen polyvinyl chloride (PVC) piezometers for monitoring perchlorate concentrations in the Llagas Subbasin.

23. Since implementation of MRP No. 2001-161 in December 2001, approximately 1,500 offsite supply wells have been sampled at least once. Presently, 312 offsite domestic supply wells, over 217 onsite and offsite monitoring wells, and six City of Gilroy sentry wells are sampled for perchlorate. Olin used the results from its sampling efforts to evaluate the suitability of using private supply wells to monitor perchlorate migration within the Llagas Subbasin. Based on its evaluation, the Discharger concluded that both types of wells – supply wells with known screen-depth intervals and multi-level monitoring wells – are necessary and appropriate to map perchlorate migration in the Llagas Subbasin. The supply wells provide representative estimates of perchlorate concentrations in the San Martin and Gilroy areas and will continue to do so because of the broad geometry of the perchlorate plume within that part of the groundwater-flow system. However, immediately south of the Facility, dedicated multi-level wells provide much more accurate mapping of the migration of perchlorate.
24. Perchlorate concentrations have been measured above the practical quantitation limit (PQL; 4.0 µg/L) up to ten miles south of the Facility, with the historic maximum of 2,600 µg/L in shallow groundwater beneath the Facility. The maximum concentration has declined to 550 µg/L beneath the Facility and perchlorate is distributed discontinuously through the Subbasin. As of the third quarter of 2007, Olin has installed 26 dedicated offsite groundwater-monitoring wells south and northeast of the Facility. Based on data collected from two recently installed deep-aquifer zone wells (MW-59 and MW-60), Olin intends to install additional deep aquifer zone wells. Additionally, the Discharger continues to collect perchlorate concentration data from existing domestic supply wells. Based on an evaluation of data collected in 2006, as presented in Olin's Llagas Subbasin Characterization (Characterization Report) submitted on March 29, 2006, offsite private supply wells that are located further from the Facility provide representative samples of perchlorate concentrations. Consequently, Olin has incorporated several offsite private domestic supply wells to monitor the perchlorate concentrations throughout the Llagas Subbasin. The Central Coast Water Board is in the process of revising the existing groundwater monitoring program and intends to incorporate the newly installed wells and selected private supply wells as part of the monitoring well program.
25. Groundwater is monitored beneath the Facility and throughout the Llagas Subbasin, both upgradient (north and northeast) and downgradient (south, southeast, and east) of the Facility. Groundwater monitoring and basin characterization are divided into four Assessment Areas (I, II, III, IV). **The area of impact includes, but is not limited to, those areas shown in Figures 3, 4, and 5.** The distribution of

perchlorate within the Llagas Subbasin, as described in MACTEC's Third Quarter 2007 Groundwater Monitoring Report, dated October 30, 2007, is as follows:

- a. **Shallow Aquifer:** Perchlorate is present in Assessment Area I above the MCL in a narrow band extending from the southern portion of the Facility to just south of Maple Avenue. Since the submittal of the Characterization Report, additional shallow aquifer monitoring data indicate that perchlorate is not present offsite above 24.5 µg/L. Perchlorate concentrations immediately downgradient of the onsite extraction wells have decreased steadily during the past three years from 10 µg/L to below the PQL (4.0 µg/L). Perchlorate was not detected at or above the MCL in Assessment Areas II-IV.
 - b. **Intermediate Aquifer:** The perchlorate plume core (>24.5 µg/L) remains limited to Area I. Perchlorate concentrations immediately downgradient of the onsite extraction well (EW-01B) have decreased steadily during the past three years and are less than 10 µg/L. Perchlorate exceeding the MCL is present in Assessment Areas II-IV.
 - c. **Deep Aquifer:** The perchlorate plume core extends at least 11,000 feet south of Middle Avenue, based on analytical results for initial samples from two new wells (MW-59 and MW-60). These results indicate that Priority Zone A (I still don't see where you've defined A, B, and C) now extends further south and encompasses recently installed wells MW-60 and MW-59. While additional characterization efforts are ongoing, the size of Priority Zone C did not change as a result of this new information. The Discharger continues characterization activities to perchlorate concentrations in the deep aquifer by installing additional wells.
26. **Onsite Soil Cleanup:** The Discharger has completed soil cleanup at the Facility. On August 3, 2004, the Executive Officer approved a combination of in situ and ex situ anaerobic bioremediation to treat perchlorate in soil. On October 26, 2006, Central Coast Water Board staff completed its review and issued a closure approval letter concerning the Discharger's July 18, 2006 *Soil In Situ Bioremediation System Closure Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California* (Closure Report). The Closure Report documents the successful completion of soil remediation activities at the Facility. Performance-monitoring results indicate that the soils were effectively treated and achieved the Central Coast Water Board's remedial goal of 0.05 milligrams per kilogram (mg/kg).
27. On November 18, 2003, Central Coast Water Board staff concurred with the installation and operation of an onsite groundwater containment and perchlorate removal system (System). The System's purpose is to provide hydraulic containment and removal of perchlorate through onsite groundwater extraction and treatment, and re-injection. The System began operation on February 23, 2004. By April 7, 2004, System startup was completed and the System has been in operation continuously since that time.

28. **Offsite Cleanup:** The approved offsite cleanup strategy consists of a phased cleanup approach for perchlorate-impacted groundwater within the Llagas Subbasin. Implementation of the phased approach includes hydraulic containment and treatment of groundwater (i.e., pump and treat) in the area of highest concentrations (plume core) in combination with monitored attenuation for those areas with lower perchlorate concentrations. The Discharger is required to evaluate the effectiveness of the phased cleanup approach to determine the need for modifications or implementation of more aggressive measures that may be needed to achieve compliance with groundwater cleanup requirements. The approved phased cleanup approach, as conditioned and clarified, is outlined in our Central Coast Water Board's response letter concerning the Discharger's June 15, 2007, *Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California*. The terms of the required cleanup activities are outlined in this Order. As groundwater cleanup proceeds, Olin must reevaluate the feasibility of achieving background concentrations or may reevaluate the feasibility of achieving an alternative groundwater cleanup level.

29. The following reports detail the presence of perchlorate in soil and or groundwater at, and beyond, the Facility:

- Environmental Engineering Consultants' *Perchlorate Investigation* dated December 7, 2000
- Environmental Engineering Consultants' *Perchlorate Investigation* dated March 21, 2001
- Law Engineering and Environmental Services' *Soil and Groundwater Investigation Report for the Olin/Standard Fusee Property* dated May 16, 2002
- MACTEC Engineering Consultants' *Phase 3 Soil and Groundwater Investigation and Remedial Action Conceptual Design Report* dated June 30, 2003
- Geosyntec Consultants' *Soil Remediation Feasibility Study* dated November 21, 2003
- Geosyntec Consultants' *Remedial Action Work Plan & 90% Design Report For Soil Remediation*, April 8, 2004.
- Geosyntec Consultants' *Soil In Situ Bioremediation System Closure Report, Olin/Standard Fusee Site, 425 Tennant Avenue, Morgan Hill, California*, dated July 18, 2006.
- MACTEC Engineering Consultants' *East of Site Characterization, Olin/Standard Fusee Site, Morgan Hill, California*, dated September 29, 2006.
- MACTEC Engineering Consultants' *Llagas Subbasin Cleanup Feasibility Study – Revised, Olin/Standard Fusee Site, Morgan Hill, California*, dated December 6, 2006.
- Geosyntec Consultants' *Area I Plume Migration Control Work Plan, Olin/Standard Fusee Site, Morgan Hill, California*, dated December 6, 2006.
- Geosyntec Consultants' *Area I Plume Migration Control Feasibility Study, Olin/Standard Fusee Site, Morgan Hill, California*, dated December 6, 2006.
- MACTEC Engineering Consultants' *Llagas Subbasin Characterization – 2006, Olin/Standard Fusee Site, Morgan Hill, California*, dated January 31, 2007.

- MACTEC Engineering Consultants' and Geosyntec Consultants' June 15, 2007, *Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California* (Cleanup Work Plan).
- July 30, 2007 *Recommendations for Final Extraction Well Locations and Designs for Priority Zone A, Olin/Standard Fusee Site, Morgan Hill, California* (Extraction Well Location letter).
- August 16, 2007 *Status Update on Priority Zone A Plume Migration Control Implementation, Olin/Standard Fusee Site, Morgan Hill, California* (Priority Zone A Status Update letter).
- MACTEC Engineering Consultants' *Quarterly Groundwater Monitoring Reports* dated October 31, 2006, January 31, 2007, April 30, 2007, July 30, 2007, and October 30, 2007.

Reports not specifically included above, but that have been submitted to the Central Coast Water Board by the Discharger and others, are located in the Central Coast Water Board file, and our FTP site at:

<http://www.waterboards.ca.gov/centralcoast/Facilities/Olin%20Perchlorate/Reports/Index.htm>.

30. **Health Effects:** The Office of Environmental Health Hazard Assessment (OEHHA) has determined that perchlorate interferes with the natural function of the thyroid gland by inhibiting the uptake of iodide. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. Such an effect decreases production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. Potassium perchlorate was used until recently to treat hyperthyroidism related to Graves disease, and is still used diagnostically to test thyroid hormone production in some clinical settings.

LEGAL AUTHORITY

31. Section 13304(a) of the California Water Code provides that:

“Any person who has discharged or discharges waste into waters of the state in violation of any waste discharge requirements or other order or prohibition issued by a regional board or the state board, or who has caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance, shall upon order of the regional board clean up the waste or abate the effects of the waste, or, in the case of threatened pollution or nuisance, take other necessary remedial action, including but not limited to, overseeing cleanup and abatement efforts. Upon failure of any person to comply with the cleanup or abatement order, the Attorney General, at the request of the regional board, shall petition the superior court for that county for the issuance of an injunction requiring the person to comply with the order. In the suit, the court shall have jurisdiction to

grant a prohibitory or mandatory injunction, either preliminary or permanent, as the facts may warrant.”

32. Section 13267(b)(1) of the California Water Code provides that:

“In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.”

33. Section 13304(c)(1) of the California Water Code provides that:

“. . . the person or persons who discharged the waste, discharges the waste, or threatened to cause or permit the discharge of the waste within the meaning of subdivision (a), are liable to that government agency to the extent of the reasonable costs actually incurred in cleaning up the waste, abating the effects of the waste, supervising cleanup or abatement activities, or taking other remedial actions. . . .”

34. The State Water Resources Control Board (hereafter State Water Board) has adopted Resolution No. 92-49, the *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*. This Policy sets forth the policies and procedures to be used during an investigation or cleanup of a polluted site and requires that cleanup levels be consistent with State Water Board Resolution 68-16, the *Statement of Policy With Respect to Maintaining High Quality of Waters in California*. Resolution 92-49 and the Basin Plan establish the cleanup levels to be achieved. Resolution 92-49 requires the waste to be cleaned up to background, or if that is not reasonable, to an alternative level that is the most stringent level that is economically and technologically feasible in accordance with Title 23, California Code of Regulations (CCR) Section 2550.4. Any alternative cleanup level to background must: (1) be consistent with the maximum benefit to the people of the state; (2) not unreasonably affect present and anticipated beneficial use of such water; and (3) not result in water quality less than that prescribed in the Basin Plan and applicable Water Quality Control Plans and Policies of the State Water Board. Resolution 92-49 directs that investigation proceed in a progressive sequence. To the extent practical, it directs the Regional Water Board to require and review for adequacy written work plans for each element

and phase, and the written reports that describe the results of each phase, of the investigation and cleanup.

35. **Water Quality Control Plan:** The Water Quality Control Plan, Central Coast Region (Basin Plan) designates beneficial uses of the waters of the State and establishes water quality objectives to protect those areas. The Basin Plan incorporates statewide plans and policies by reference and contains a strategy for protecting beneficial uses of State Waters. This Order implements the water quality objectives and other requirements stated in the Basin Plan. Pursuant to Chapter 2 of the Basin Plan, the present and potential future beneficial uses of groundwater underlying the Facility, and in the area of the perchlorate plume, include:
- a. Domestic and municipal water supply.
 - b. Agricultural water supply.
 - c. Industrial water supply.
36. **Regulatory Standards:** On October 18, 2007, the California Department of Public Health (CDPH) established an MCL of 6.0 micrograms per liter ($\mu\text{g/L}$) (or parts per billion) for perchlorate in drinking water. The MCL is the maximum concentration of a chemical that is allowed in public drinking water systems. According to CDPH, the MCL is an enforceable standard and is set as close to the public health goal (PHG) as feasible and is based upon treatment technologies, costs (affordability), and other feasibility factors, such as availability of analytical methods, treatment technology, and costs for achieving various levels of removal.
37. **Groundwater Use:** Groundwater throughout the affected area and Llagas Subbasin is actively used as a source for domestic, municipal, agricultural and industrial supply waters. Section 13050(l) of the California Water Code defines "pollution" as an alteration of the water quality to a degree that unreasonably affects either beneficial uses or facilities that serve these beneficial uses. Section 13050(l) (2) provides that "pollution may include contamination." Section 13050(k) defines "contamination" as "an impairment of the quality of the waters of the state by waste to a degree, which creates a hazard to the public health through poisoning or through the spread of disease." Section 13050(m) defines "nuisance" as "anything which meets all of the following requirements: (1) is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property. (2) Affects at the same time an entire community or neighborhood, or any considerable number of persons. (3) Occurs during, or as a result of, the treatment or disposal of wastes." The discharge of perchlorate has caused groundwater pollution and interferes with the municipal and domestic use of thousands of people that rely on the affected groundwater as their primary source of drinking water supply. The plume constitutes both pollution and nuisance.
38. The Basin Plan contains numerical water quality objectives that apply to surface water and groundwater, including, drinking water maximum contaminant levels

(MCLs) promulgated in Title 22, CCR, Division 4, Chapter 15 (hereafter Title 22) that the Basin Plan applies directly to waters designated as MUN. Thus, the MCL recently adopted by CDPH is a numeric water quality objective of the Basin Plan. The Basin Plan includes the following narrative objective: "Wherever the existing quality of water is better than the quality of water established herein as objectives, such existing quality shall be maintained unless otherwise provided by the provisions of the State Board Resolution No. 68-16, 'Statement of Policy with Respect to Maintaining High Quality of Waters in California,' including any revisions thereto." (Basin Plan, Chapter 3, Section II.A.). The Basin Plan also contains the following prohibition: "Waste discharges shall not contain materials in concentrations which are hazardous to human, plant, animal, or aquatic life." (Basin Plan, Chapter 5, Section IV.A.)

39. The perchlorate discharged at the site is a "waste" as defined in California Water Code section 13050(d). The discharge of perchlorate at the site exceeds or violates the water quality objectives and the Basin Plan prohibition. As described in Findings Nos. 25 and 26, the perchlorate exceeds the applicable numeric water quality objective in some areas of the site. The discharge of perchlorate at the site violates the narrative water quality objectives and prohibition. The discharge of perchlorate has interfered with the use of hundreds of private domestic wells and has interfered with the use of water supplies for municipal and domestic beneficial uses. Perchlorate, as a pure product, is defined by the Department of Transportation as a hazardous substance, based on its ignitability/explosive hazard.

CLEANUP LEVELS

40. **Basis for Groundwater Cleanup Level:** State Board Resolution No. 68-16 (Anti-Degradation Policy) requires:
- a. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.
 - b. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.
41. The groundwater impacted by the perchlorate plume is "high quality water" for purposes of State Board Resolution No. 68-16. The determination of whether water

is a “high quality water” is made on a constituent-by-constituent basis. Although nitrate exceeds the MCL through much of the basin, the perchlorate plumes described in this Order degrade the high quality waters of the state.

42. State Board Resolution No. 92-49 provides that the Water Board shall ensure that the cleanup attain background unless that is not reasonable. If the Central Coast Water Board determines that achieving background is not feasible it may set a less stringent cleanup level. However, the cleanup level must:

- a. Be consistent with maximum benefit to the people of the state;
- b. Not unreasonably affect present and anticipated beneficial use of such water;
- c. Be the most stringent level that is technologically and economically feasible;
- d. Be stringent enough that it does not pose a threat to public health or safety; and
- e. Not result in water quality less than that prescribed in the “Water Quality Control Plans and Policies adopted by the State and Regional Water Boards.” (e.g., attain water quality objectives)

43. **Background Level:** Until the Discharger substantiates its assertion that a measurable background level of perchlorate exists within the entire Llagas Subbasin or discrete areas within the Llagas Subbasin, the Central Coast Water Board will continue to find that the background perchlorate level in groundwater (for the majority of the Llagas Subbasin) is less than the method detection limit (MDL³). In accordance with State Board Resolution No. 92-49, the background concentration of perchlorate in groundwater within the Llagas Subbasin must be the level of perchlorate that would exist in groundwater without regard to any discharges from the Facility.⁴

44. **Other Potential Sources:** On February 10, 2005, the Discharger and the Central Coast Water Board stipulated to a stay of a 13267 Order [December 8, 2004] requiring the Discharger to conduct an investigation of area northeast of Facility. Item No. 4 of the Stay states, “*The Santa Clara Valley Water District (“District”) has indicated that it is willing to commence a forensics investigation to the northeast of the Site. The primary focus of the District’s investigation will be outside of the area in which the area requires the Dischargers to conduct their forensics investigation (the “Forensics Area”). However, the District has indicated that it will also perform some of this investigation within the Forensics Area.*” The Santa Clara Valley Water District (Water District) is implementing a “Work Plan for the Perchlorate Source and Background Study of the Llagas Groundwater Subbasin” (June 2005) that will utilize forensic chemistry to determine, if and to what extent, suspected natural and anthropogenic sources of perchlorate are contributing to the existing perchlorate groundwater impacts. While the Water District’s forensic investigation may not provide definitive results, we trust it will provide additional data that are likely to be

³ The MDL is instrument-specific and is defined as the lowest concentration that a given instrument can record. The MDL for perchlorate using United States Environmental Protection Agency (USEPA) Method 314.0 is typically 1.4 micrograms per liter (µg/L).

⁴ In the case of commingled plumes from multiple identifiable dischargers, background is determined without regard to the commingled discharges.

relevant to any further proceedings related to the source(s) of perchlorate northeast of the Site. Presently, Water District staff anticipates that preliminary results will be available for review in Spring 2008.

45. The Discharger and the City of Morgan Hill have provided data indicating an unexplained presence of perchlorate concentrations in groundwater in the upper reaches of the Llagas Subbasin, which are not attributed to the Olin Facility. However, the Discharger has not demonstrated, based on sound scientific evidence, that there are other sources of the long-term perchlorate concentrations for the majority of the Llagas Subbasin including the area immediately north and northeast of the Facility or other discrete areas within the Llagas Subbasin. Until the Discharger substantiates its assertion that other source(s) of perchlorate are contributing to the detected impacts, the Central Coast Water Board will continue to find that the source is the Olin Facility.
46. The Central Coast Water Board has determined it is not reasonable at this time to establish a cleanup level that is less stringent than background for the Llagas Subbasin. As additional data are collected and evaluated, including data associated with the Water District's forensic chemistry study (for background determination purposes) and ongoing performance monitoring data, and as the Central Coast Water Board thoroughly evaluates the efficacy of the selected remediation strategy, establishing an alternative cleanup level less stringent than background will be reevaluated.
47. This Order requires the Discharger to implement active remediation within the highest concentration areas expeditiously. The Discharger is required to proceed with immediate implementation of groundwater cleanup (hydraulic containment and treatment) with the cleanup objective (goal) of achieving the background concentration⁵ within each individual aquifer zone and those portions of the Llagas Subbasin impacted by discharges from the Facility. As groundwater cleanup proceeds, the Discharger may reevaluate the feasibility of achieving cleanup to background concentrations. Should the Discharger submit information that indicates background water quality cannot be reasonably restored, Central Coast Water Board staff will review that information to ensure consistency with State Board Resolution No. 92-49, Section III.F.1.
48. Concurrence from the Central Coast Water Board or its staff on a proposed cleanup plan does not excuse the Discharger of the obligation to complete the cleanup in compliance with Resolution No. 92-49, even if the Discharger's selected method or strategy is not successful or does not result in full compliance with Resolution No. 92-49. In that event, the Central Coast Water Board may require the Discharger to propose additional or alternative remedies until the Discharger achieves compliance with Resolution No. 92-49.

⁵ If the implemented cleanup technology proves unsuccessful in achieving background in a technically and economically feasible manner, the Central Coast Water Board may adjust cleanup goals later.

DISCHARGER LIABILITY

49. As described in the above Findings, the Discharger is subject to an order pursuant to Water Code section 13304 because the Discharger has discharged or deposited waste and caused or permitted waste to be discharged or deposited where it has discharged to waters of the state and has created, and continues to threaten to create, a condition of pollution and/or nuisance. The condition of pollution and/or nuisance is a priority violation and issuance or adoption of a cleanup or abatement order pursuant to Water Code section 13304 is appropriate and consistent with policies of the Regional Water Board. If additional parties are determined to be responsible for this discharge of waste, this Order may be amended by the Central Coast Water Board or the Executive Officer, and issued to those parties and the Dischargers.
50. As described in the above Findings, the Discharger is subject to an order pursuant to Water Code section 13267. As described in this Order, existing data and information about the Facility indicates that waste has been discharged or is discharging from the Facility described above. The Facility is owned or operated, or formerly owned or operated by the Discharger named in this Order. This Order requires monitoring, work plans, and reports pursuant to Water Code Section 13267. This finding is made in compliance with Section 13267. The work plans and monitoring required by this Order are necessary to design and implement a cleanup plan for the perchlorate-impacted groundwater and to determine compliance with this Order.
51. The Discharger may not rely on any groundwater modeling unless the Discharger provides the Water Board with a legal copy of the modeling software, electronic input data files, assumptions used, model calibration information and all other data or information used in the model upon request of the Executive Officer. All such files, assumptions, information and data (other than commercial software programs) shall become a part of the administrative record for this Facility and will be available to the public in any proceeding regarding enforcement or revisions of this Order.
52. **Notification:** The Central Coast Water Board has notified the Discharger and all interested agencies and persons of its intent pursuant to California Water Code Section 13304 to issue this Order. The Central Coast Water Board has made every reasonable attempt to notify these individuals and has provided them with an opportunity to submit their written views and recommendations. The draft Order was sent to interested parties on September 18, 2007. The Central Coast Water Board accepted public comments on the draft Order until November 2, 2007.
53. **California Environmental Quality Act:** This Order updates and clarifies Order No. R3-2005-0014, as amended by Order No. R3-2006-0112, but does not remove any requirements of the prior Order. This Order will not cause any adverse change to the environment as compared to the current baseline, which includes the existing pollution. Therefore, this Order is exempt from the California Environmental Quality Act (Public Resources Code Section 21000, et seq.) under the “common sense

exemption” under Section 15061(b)(3), Title 14, CCR, because it is an activity that “is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.” In addition, this enforcement action is being taken for the protection of the environment and as such is exempt from the provisions of CEQA in accordance with Sections 15307 and 15308, Chapter 3, Title 14, California Code of Regulations (CCR). The issuance of this Order is also an enforcement action taken by a regulatory agency and is exempt from the provisions of CEQA pursuant to Section 15321(a)(2), Title 14, CCR.

54. Cost Recovery: Pursuant to Section 13304 of the California Water Code, the Central Coast Water Board is entitled to, and may seek, reimbursement for all reasonable costs actually incurred by the Central Coast Water Board to investigate unauthorized discharges of wastes or to oversee cleanup of such waste, abatement of the effect thereof, or other remedial action pursuant to this Order.

55. State Board Review: Any person affected by this Central Coast Water Board action may petition the State Board to review the action in accordance with Section 13320 of the California Water Code and Title 23, California Code of Regulations, Section 2050. The State Board, Office of Chief Counsel, must receive the petition within 30 days of the date of this Order. Copies of the law and regulations applicable to filing petitions will be provided upon request.

IT IS HEREBY ORDERED, pursuant to Sections 13267 and 13304 of the California Water Code that the Discharger, its agents, successors or assigns, shall cleanup and abate the effects of the perchlorate discharged from the Facility, as follows:

- A. This Order replaces Cleanup Order No. R3-2005-0014 and Cleanup Order No. R3-2006-0112, which are hereby rescinded.
- B. The Discharger shall cleanup perchlorate-impacted groundwater to achieve background concentrations. The background concentration is the level of perchlorate that would exist in groundwater without regard to any discharges from the Facility. If any part of the Facility plume has commingled with other plumes with an identifiable source, the Executive Officer may require the Discharger and the other sources to jointly clean up the commingled plume to background (the level of perchlorate that would exist without regard to any of the subject discharges).
- C. The Discharger shall install ion exchange (IX) systems on all domestic water supply wells that are actively used as a potable source and with perchlorate concentrations greater than 8.0 µg/L. The Discharger is required to operate and maintain the IX systems and provide an alternative water supply until compliance with State Board Order No. WQ 2005-0007 is achieved.

D. IMPLEMENTATION OF OFFSITE GROUNDWATER CLEANUP

The Discharger shall proceed with immediate implementation of a phased groundwater cleanup approach within the Llagas Subbasin, as approved, conditioned and clarified in the Central Coast Water Board's upcoming response letter concerning Olin's June 15, 2007, *Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California* (Cleanup Work Plan), and herein. The approved cleanup strategy consists of a phased cleanup approach for perchlorate-impacted groundwater within the Llagas Subbasin and applies to those portions of the Llagas Subbasin that have been impacted by perchlorate discharges from the Olin Facility. Implementation of the phased approach includes hydraulic containment and treatment of groundwater (i.e., pump and treat) in the area of highest concentrations (plume core) in combination with monitored attenuation for those areas with lower perchlorate concentrations. For the purposes on this Order, the "plume core" for the intermediate aquifer zone of the Llagas Subbasin includes perchlorate concentrations within Priority Zones A and B. The "plume core" for the Shallow and Deep aquifer zones is as defined in Olin's June 15, 2007 Cleanup Work Plan. The approved cleanup strategy includes the following components:

- **Extraction Wells:** Installation of a sufficient number of dedicated groundwater extraction wells at appropriate locations within the plume core that exists within the intermediate and deep aquifer zones to achieve effective hydraulic control of perchlorate-impacted groundwater to downgradient areas, and achieve compliance with groundwater cleanup requirements.
- **Monitored Attenuation:** Monitored attenuation is conditionally approved as a remedy component of the approved groundwater cleanup strategy and shall be implemented throughout the areas of the Llagas Subbasin with lower concentrations of perchlorate. Monitored attenuation shall apply to all portions of the Llagas Subbasin outside of the plume core (within the shallow, intermediate and deep aquifer zones), including those portions of the deep aquifer zone immediately east and northeast of the Facility.

Due to the uncertainties concerning the long-term effectiveness and the predicted timeframes estimated for groundwater cleanup, the Discharger shall implement the monitored attenuation remedy component in strict accordance with USEPA's guidance document⁶ concerning the use of monitored attenuation at groundwater cleanup sites.

The Discharger shall continuously evaluate and demonstrate that the selected cleanup approach (monitored attenuation in conjunction with hydraulic control and treatment measures) will effectively achieve remediation objectives within a timeframe that is reasonable compared to that offered by other methods. The phased cleanup strategy shall be evaluated by implementing an approved Performance Monitoring Program and a Remedial Contingency Plan. The

⁶ United States Environmental Protection Agency, OSWER Directive Initiation Request, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," April 21, 1999.

Performance Monitoring Program is necessary to evaluate whether the monitored attenuation remedy option is performing as expected and is capable of attaining the cleanup level within the anticipated (reasonable) timeframes. The Remedial Contingency Plan is a backup remedy that provides for modification of the approved groundwater remedy, if the monitored attenuation component fails to perform as anticipated.

E. IMPLEMENTATION OF AREA I PLUME MIGRATION CONTROL

The Discharger shall comply with the following Implementation Schedule, including future revisions approved by the Executive Officer by amendment to this Order or by letter.

1. **By November 30, 2007** – The Discharger shall complete installation and hydraulic testing of the intermediate zone groundwater extraction well.
2. **By March 28, 2008** – The Discharger shall complete installation and hydraulic testing of the deep aquifer groundwater extraction well.
3. **By April 15, 2008** – The Discharger shall prepare and submit an Area I Plume Migration Control FS Addendum. The addendum shall include the following information for the intermediate and deep aquifer zones:
 - a. Resolution and final selection of the extracted water treatment and disposition option.
 - b. The conceptual design for the Assessment Area I containment/cleanup system incorporating extraction rates based on well-yield testing of the extraction wells and any newly available results of ongoing characterization activities.
 - c. An updated schedule for design and implementation of the Assessment Area I containment system. All modifications to proposed number of extraction wells, locations, and extraction rates must be substantiated with data.
 - d. Recommendations and proposed schedule for completing all additional deep zone characterization activities that may be deemed necessary, and
 - e. All other pertinent information concerning the deep zone characterization activities, including specific recommendations and proposed schedule for the installation, testing, and proposed locations of any additional extraction wells concerning the intermediate and deep aquifer zones.
 - f. Specifically address cleanup implementation options (i.e., proceed with current approach of a combined groundwater containment system for the intermediate and deep aquifer zones versus implementing independent groundwater containment systems for the intermediate and deep aquifer zones).
4. **By April 15, 2008** – The Discharger shall submit an Intermediate Aquifer Zone Cleanup Work Plan that specifically addresses the implementation of a groundwater containment system within the intermediate aquifer zone. The Cleanup Work Plan shall propose a specific groundwater containment system

(hydraulic control and cleanup) that will provide effective plume migration control and cleanup of Priority Zones A and B.

5. **By August 8, 2008, November 28, 2008, and February 13, 2009** – The Discharger shall submit the 45%, 90% and 100% Engineering Design Packages, respectively, for the Area I System. The 100% design package will include final versions of the following design items: (i) design report, (ii) technical specifications, (iii) design drawings, (iv) design calculations, (v) Functional Checkout Plan, (vi) System Start-up Plan, (vii) Performance Monitoring Plan, (viii) Contingency Plan updates (as necessary), and (ix) supporting data (e.g., results of pilot test (if conducted), current water quality data, etc.).
 6. **Between April 13 and September 30, 2009** - The Discharger shall construct the Area I containment system.
 7. **Between October 5 and November 30, 2009** – The Discharger shall perform system startup and shakedown (testing & evaluation) on the intermediate and deep aquifer extraction wells.
 8. **By January 15, 2010** – The Discharger shall prepare and submit the commissioning and startup report for the Area I containment system. This report will document the activities conducted during commissioning and startup of the Area I containment system. The report shall also include as-built drawings for the Area I containment system.
- F. The Discharger shall implement this Order as directed by the Executive Officer and consistent with the following documents and staff responses. :
1. MACTEC Engineering Consultants' *Llagas Subbasin Cleanup Feasibility Study – Revised, Olin/Standard Fusee Site, Morgan Hill, California* (Revised Cleanup FS Report), dated December 6, 2006. Central Coast Water Board letter dated March 29, 2007.
 2. Geosyntec Consultants' *Area I Plume Migration Control Work Plan, Olin/Standard Fusee Site, Morgan Hill, California* (Area I Plume Migration Control Work Plan), dated December 6, 2006. Central Coast Water Board letter dated March 29, 2007.
 3. Geosyntec Consultants' *Area I Plume Migration Control Feasibility Study, Olin/Standard Fusee Site, Morgan Hill, California* (Area I FS Report), dated December 6, 2006. Central Coast Water Board letter dated March 29, 2007.
 4. MACTEC Engineering Consultants' *Llagas Subbasin Characterization – 2006, Olin/Standard Fusee Site, Morgan Hill, California* (2006 Characterization Report), dated January 31, 2007. Central Coast Water Board letter dated May 9, 2007.
 5. Geosyntec Consultants' *Area I Extraction Well Installation Work Plan, Morgan Hill, California*, dated April 30, 2007. Central Coast Water Board letter dated June 11, 2007.

6. MACTEC Engineering Consultants' and Geosyntec Consultants' *Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California* (Cleanup Work Plan), dated June 15, 2007. Central Coast Water Board Letter issue in November 2007.

G. CHARACTERIZATION REPORT UPDATES - By January 30, 2008, and yearly thereafter: The Discharger shall submit an update to the 2006 Characterization Report documenting all site characterization activities performed. The required yearly updates may be incorporated into other required technical reports, as approved by the Executive Officer.

H. ANNUAL CLEANUP PROGRESS STATUS REPORTS

Beginning on January 31, 2008, the Discharger shall submit annual **remediation progress updates** concerning the effectiveness of the Area I hydraulic containment system and monitored attenuation (MA) remedy. The yearly updates must summarize the results of all the evaluations performed to date and include:

1. Evaluation and recommendations of performance monitoring program for containment system and MA remedy.
2. Evaluation and recommendations of extraction system modification and or continued operation.
3. Evaluation and recommendations of treatment system modification and or continued operation.
4. Evaluation of MA remedy – includes a presentation and discussion of statistical evaluation and spatial analysis results, with respect to MA remedy.
5. Determination if remedial contingency plan must be implemented.
6. Findings of additional field investigations.

I. FIVE-YEAR STATUS REPORT AND EFFECTIVENESS EVALUATION

Five years from the issuance date of this Order [and each five-year anniversary after that], submit a technical report acceptable to the Executive Officer that includes a summary of the results of any additional investigation; an evaluation of the effectiveness of the final cleanup measures installed and cleanup costs for the prior five-year period; additional recommended measures to achieve final cleanup goals, if necessary; and the tasks and time schedule necessary to implement any additional final cleanup measures. This report shall evaluate and document the overall cleanup strategy. If the groundwater cleanup goal in this Order has not been achieved and is not expected to be achieved through continued groundwater extraction, this report shall also evaluate whether it is feasible to achieve the cleanup goal, and if so, a proposal for procedures to do so. This report shall also include cumulative analytical data for the five-year period.

J. COMPLETION OF GROUNDWATER CLEANUP

1. Groundwater cleanup will be considered complete when Olin complies with the cleanup level of background concentration⁷ within each individual aquifer zone
-

and those portions of the Llagas Subbasin impacted by discharges from the Olin site, or a less stringent cleanup level consistent with State Water Board Resolution 92-49 and approved by the Executive Officer.

2. **Groundwater Extraction Curtailment:** Prior to curtailing groundwater extraction, the Discharger shall submit a technical report and an implementation schedule acceptable to the Executive Officer containing a proposal for curtailing pumping from groundwater extraction well(s) and the criteria used to justify such curtailment. Curtailment of groundwater extraction may include, but is not limited to: final shutdown of the system, phased approach to shutdown, pulsed pumping, or a significant change in pumping rates. The report shall include the rationale for curtailment or modifying the onsite and offsite systems. This report shall also include data to show that the cleanup goal (background concentration) for perchlorate has been achieved and has stabilized or is stabilizing, and that the potential for perchlorate concentrations rising above the cleanup goal or an approved alternate cleanup goal is minimal. This report shall also include an evaluation of the potential for continued migration (horizontal and vertical) of perchlorate.
3. All system modifications to the containment/cleanup systems are subject to approval by the Executive Officer. This requirement may be waived by the Executive Officer if deemed appropriate.
4. **Completion of Groundwater Well Curtailment:** Within 60-days of curtailing groundwater extraction, the Discharger shall submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task H.2, above.
5. The Discharger shall comply with all time schedules included as part of or referenced by this Order or as directed by the Executive Officer.

K. **EVALUATION OF NEW TECHNICAL INFORMATION**

The Discharger may submit a technical report acceptable to the Executive Officer evaluating new technical and economic information that indicates that cleanup standards or cleanup technologies in some areas may be considered for revision. The technical report shall not be required unless the Executive Officer determines that such new information indicates a reasonable possibility that the Order may need to be changed.

L. **MONITORING AND REPORTING**

The Discharger shall comply with Monitoring and Reporting Program (MRP) Nos. 2001-161 (revised August 6, 2004) and R3-2003-0168, including any existing MRPs or other 13267 orders, any revisions the Executive Officer makes to such MRP(s), and any subsequent technical, monitoring or reporting requirements issued by the Executive Officer related to monitoring and cleanup of the perchlorate plume originating at the Olin Facility.

M. REVISIONS TO ORDER

This Order in no way limits the authority of the Central Coast Water Board to institute additional enforcement actions or to require additional investigation or cleanup at the Facility consistent with the California Water Code. This Order may be revised by the Executive Officer or the Central Coast Water Board at any time as additional information becomes available, including without limitation, revisions of this Order to name additional Dischargers.

N. AMENDMENT OF DUE DATES

If, for any reason, the Discharger is unable to perform any activity or submit any document in compliance with the schedules in this Order or in compliance with any requirement of this Order, the Discharger may request, in writing, an extension of the time specified. The extension request shall include justification for the delay and shall be received at least 60-days prior to the scheduled deadline, or as soon as a delay is confirmed, whichever ever comes first. The Executive Officer may grant the request by revision of this Order or by a letter.

O. OVERSIGHT COSTS

The Discharger shall be liable, pursuant to California Water Code Section 13304, to the Central Coast Water Board for all reasonable costs incurred by the Central Coast Water Board to investigate unauthorized discharges of waste, or to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, pursuant to this Order. The Discharger shall reimburse the Central Coast Water Board for all reasonable costs associated with investigation or oversight of the cleanup of this facility. Failure to pay any invoice for the Central Coast Water Board's investigation or oversight costs within the time stated in the invoice (or within thirty days after the date of invoice, if the invoice does not set forth a due date) shall be considered a violation of this Order.

All technical and monitoring plans and reports required in conjunction with this Order are required pursuant to Section 13267 of the California Water Code and shall include a statement by the Discharger, or an authorized representative of the Discharger, certifying (under penalty of perjury in conformance with the laws of the State of California) that the workplan and/or report is true, complete, and accurate. Cleanup reports and/or hydrogeological reports and/or investigation reports and/or technical reports and/or plans shall be prepared by, or under the direct supervision of, and signed and stamped by a California Professional Geologist, Certified Engineering Geologist, or Civil Engineer.

FAILURE TO COMPLY WITH THE PROVISIONS OF THIS ORDER MAY SUBJECT THE DISCHARGER TO FURTHER ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO, ASSESSMENT OF CIVIL LIABILITY UNDER SECTIONS 13268 AND 13350 OF THE CALIFORNIA WATER CODE AND REFERRAL TO THE DISTRICT ATTORNEY OR ATTORNEY GENERAL FOR INJUNCTIVE RELIEF AND CIVIL OR CRIMINAL LIABILITY.

Roger W. Briggs
Executive Officer

Date

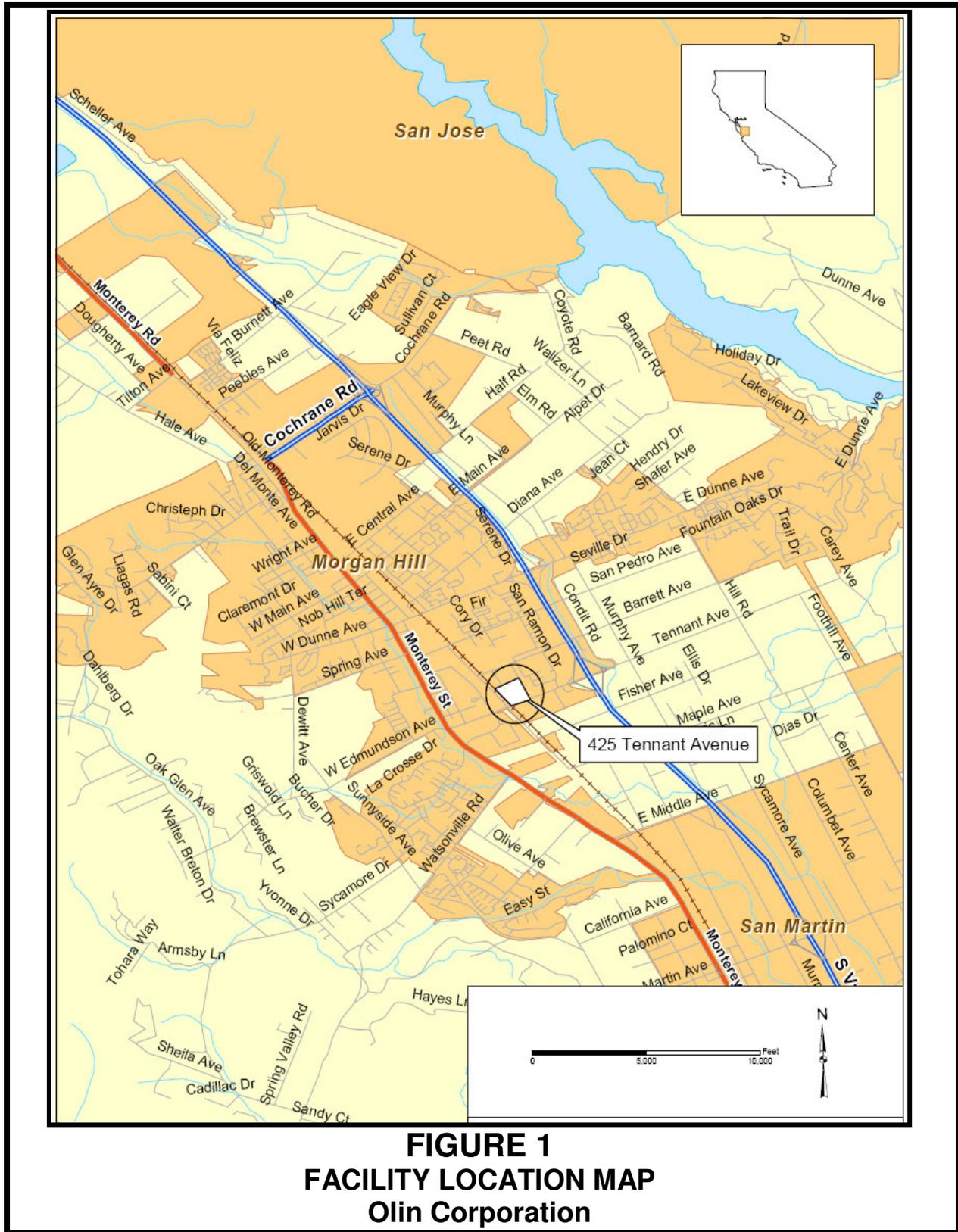


FIGURE 1
FACILITY LOCATION MAP
Olin Corporation

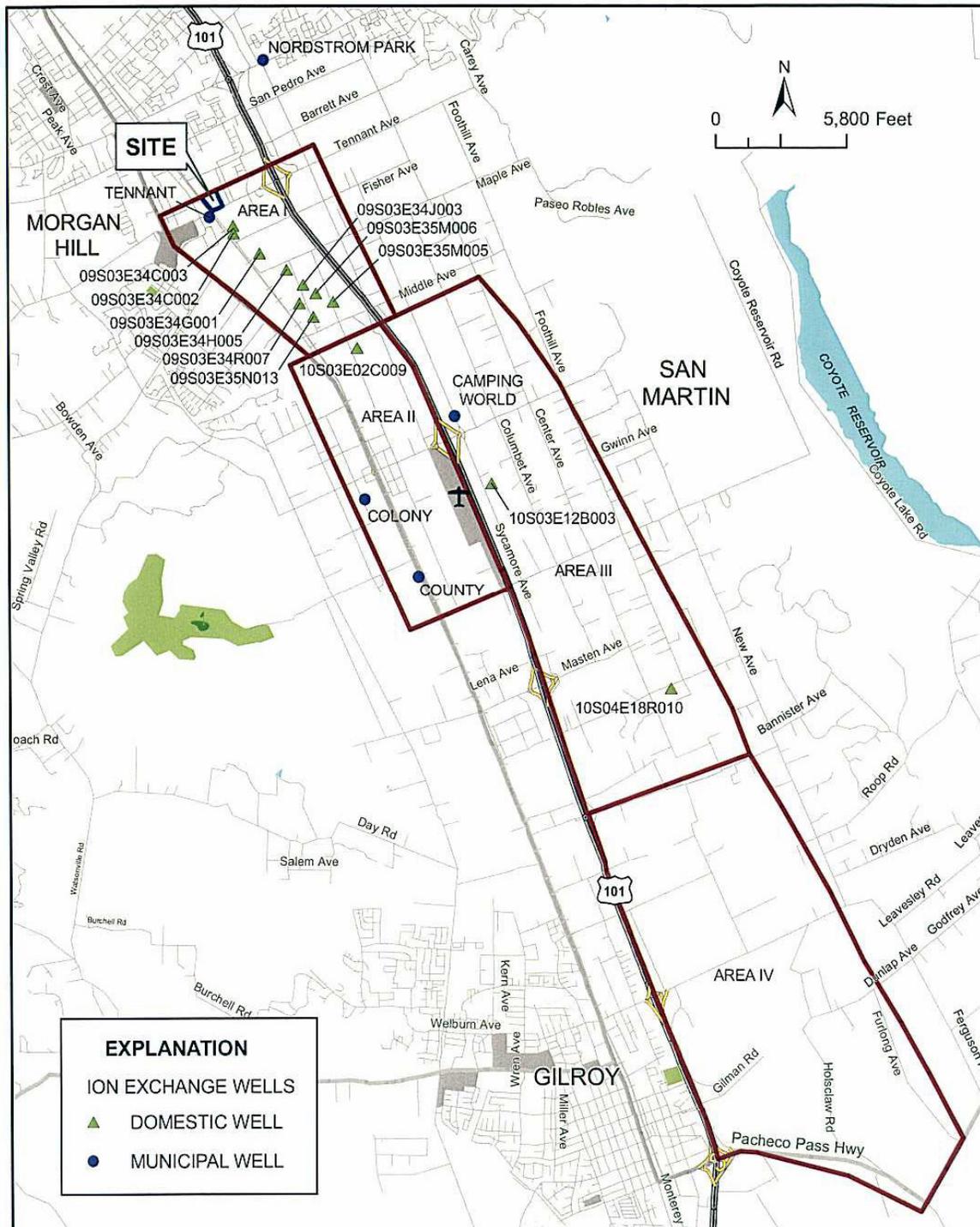
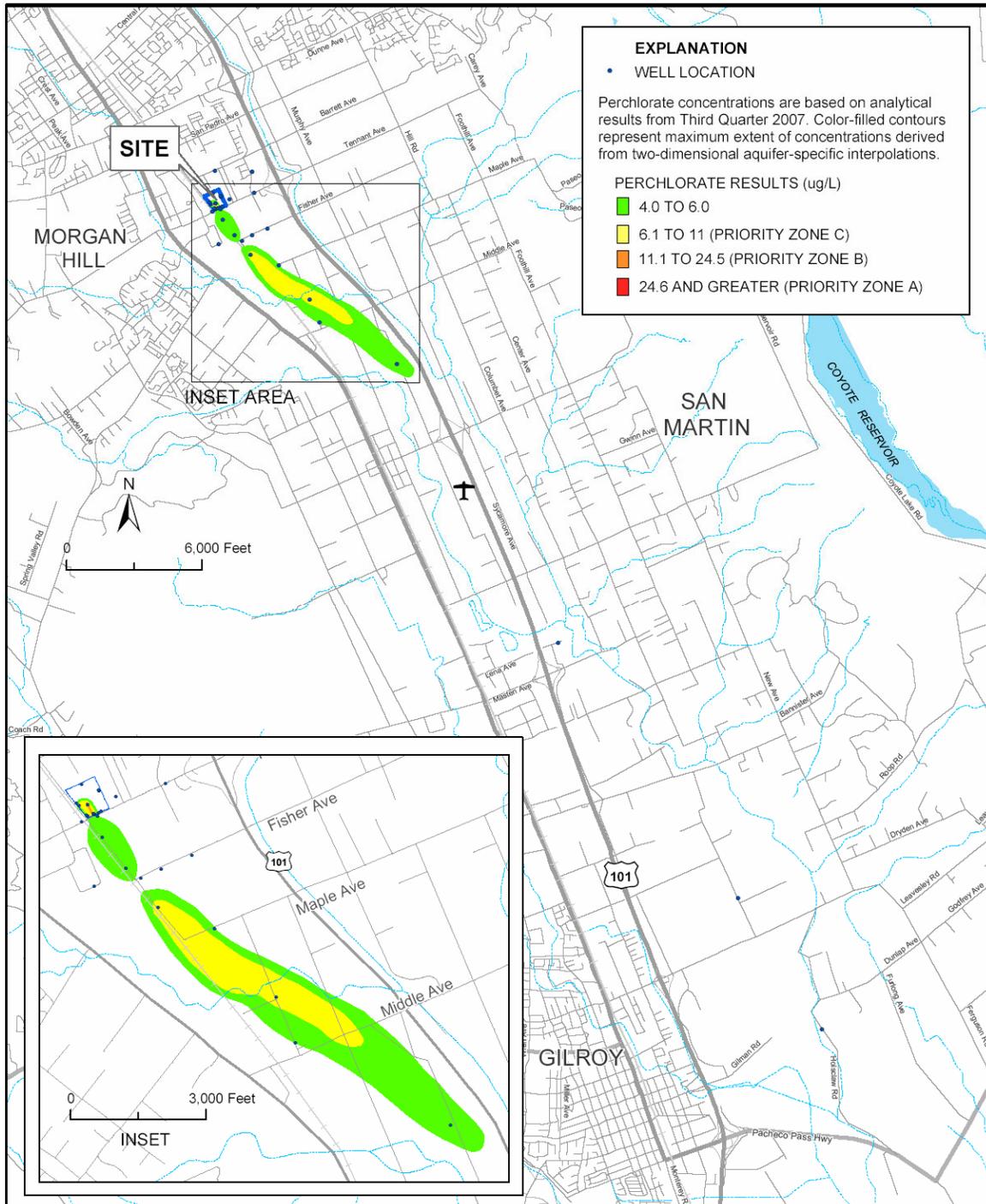


FIGURE 2
ION EXCHANGE WELL LOCATIONS
Olin Corporation



**FIGURE 3
SHALLOW AQUIFER PERCHLORATE PLUME
Olin Corporation**

(MACTEC, 10/30/2007—Third Quarter 2007 Groundwater Monitoring Report, Figure 3.21)

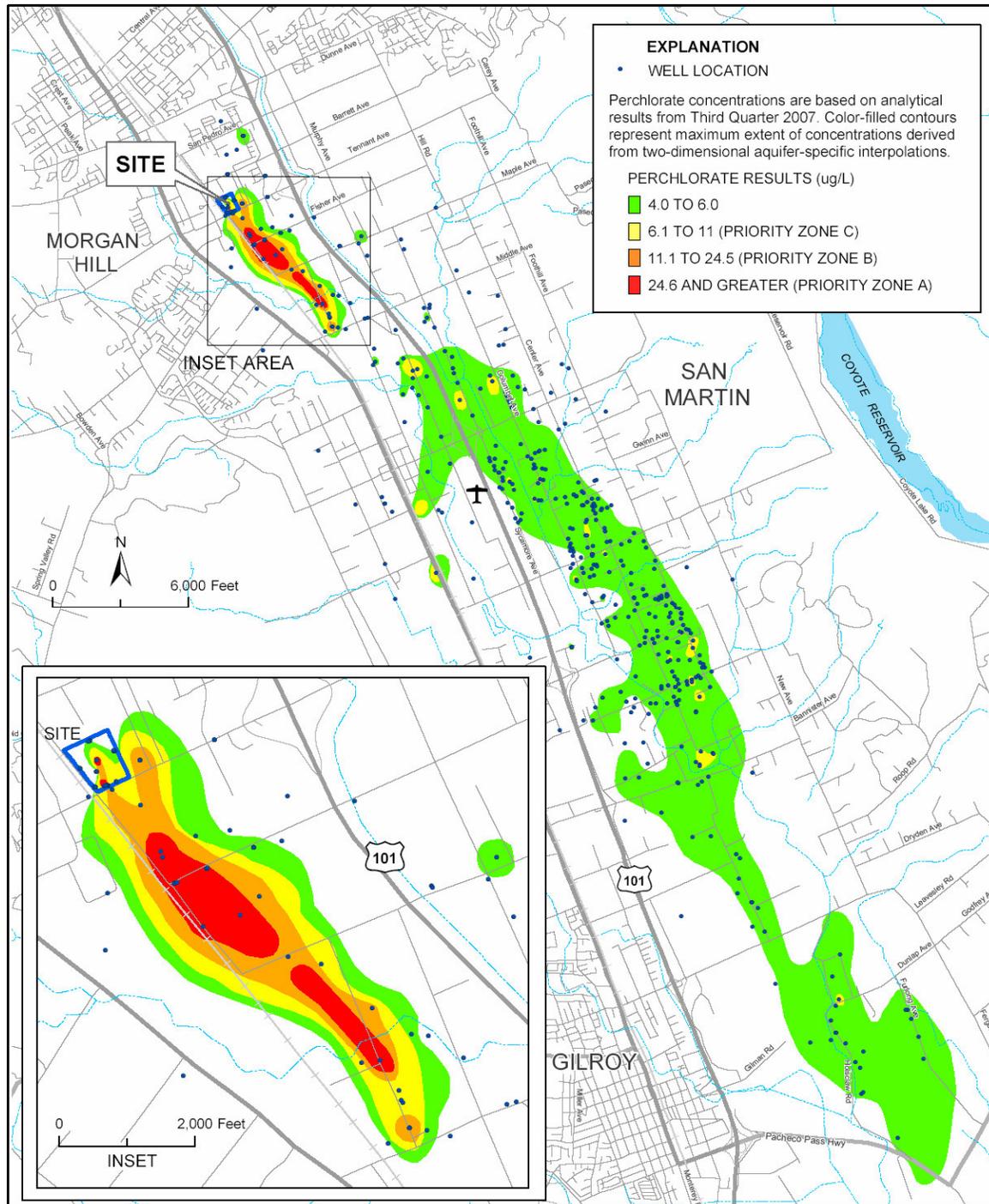
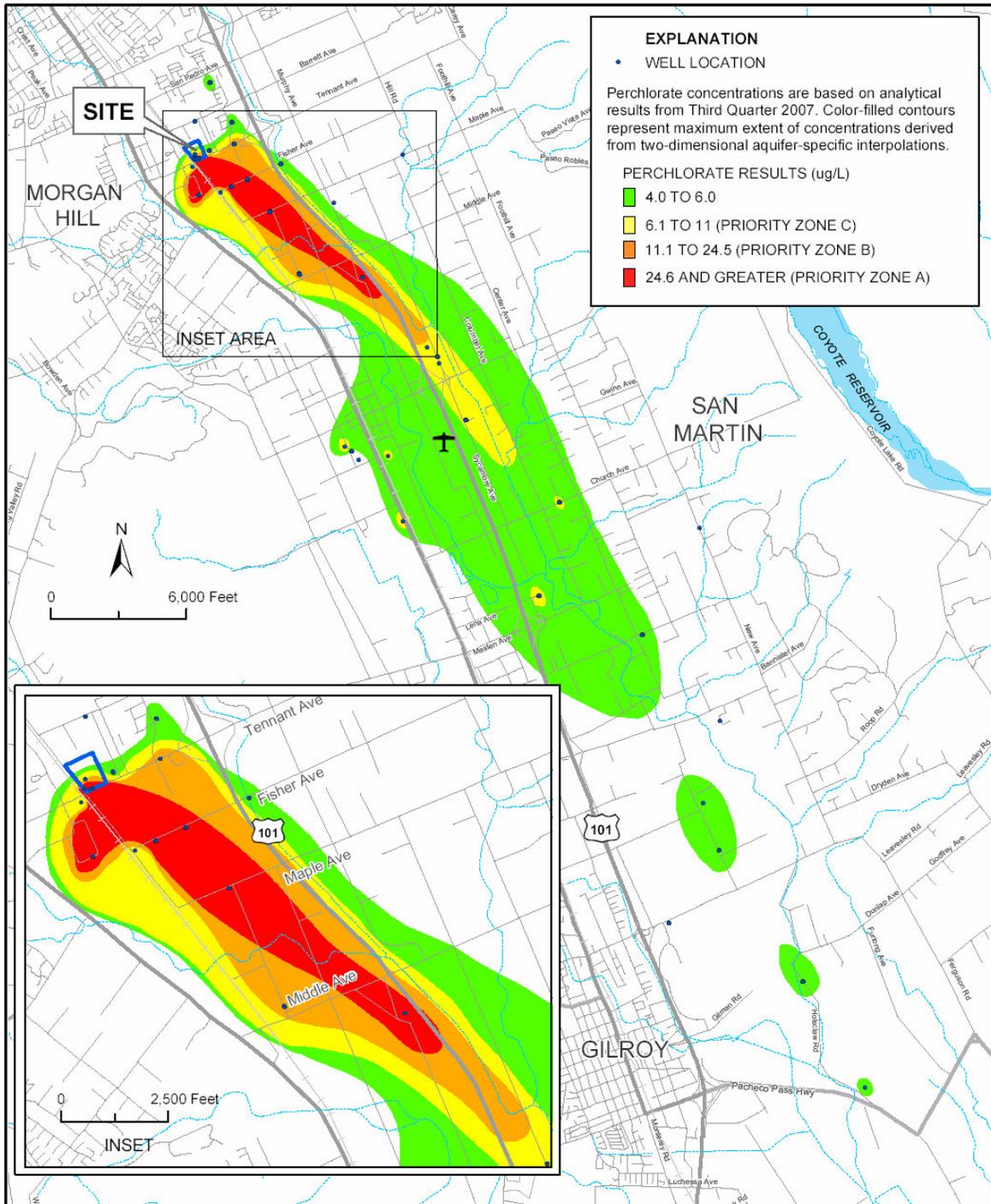


FIGURE 4
INTERMEDIATE AQUIFER PERCHLORATE PLUME
Olin Corporation

(MACTEC, 10/30/2007—Third Quarter 2007 Groundwater Monitoring Report, Figure 3.22)



**FIGURE 5
DEEP AQUIFER PERCHLORATE PLUME
Olin Corporation**

(MACTEC 10/30/2007—Third Quarter 2007 Groundwater Monitoring Report, Figure 3.23)